from it. In those cases no communication with the ear sinuses existed.

4. At times, otitic abscesses were latent, and might possess very thin walls. Furthermore, they might be situated dangerously near the ventricles or the arachnoid space. In operating on these cases, if the mastoid process was first attacked, the chiseling necessary might lead to rupture of the abscesses, with a rapidly fatal issue.

5. Such abscesses might exist in the latent stage for a long time, and become manifest after an ordinary trauma to the skull.

6. In all cases, Dr. Wiener said, it was his firm belief that even though the abscess might be suspected, we should deal most radically with the suppurative ear condition first, and then boldly attack the abscess.

Taking these anatomical and clinical facts into consideration in the treatment of otitic brain abscess, we should especially consider, first, the location of the abscess; second, its duration; third, its intimate connection with an existing suppurative process in the middle-ear cavity.

THE COMMON AND UNCOMMON LOCALIZATION OF OTITIC BRAIN ABSCESS, AS ILLUSTRATED BY THE CASES, WITH RECOVERY

By B. Sachs, M.D., and A. A. Berg, M.D.

The authors stated that of all brain lesions calling for operative interference, brain abscess, and particularly otitic brain abscess, had proved to be the most promising. Abscess following upon otitic and mastoid disease was situated commonly in the temporo-sphenoidal lobe, or in the cerebellum. It was far less common in other parts of the brain. When situated in the temporo-sphenoidal lobe of the left side, there would be, in addition to the general symptoms (such as headache, somnolence, nausea, vomiting, slight optic neuritis) slight hemiparesis and the symptoms of impairment of speech perception. While the patient might be able to articulate and to use language spontaneously, the perception and interpretation of speech might be more or less defective. Sensory aphasia was no doubt a very common accompaniment of otitic brain abscess situated in the temporo-sphenoidal lobe, more particularly if such abscess was in the left half of the brain. It was a symptom which was not always apparent unless specially examined for.

If the abscess was located in the cerebellum, there would be, in addition to the general abscess symptoms, cerebellar ataxia, a diminution of the deep reflexes, possibly abducens paresis or palsy, acoustic nerve symptoms and perhaps cerebellar seizures. If the lesion was in some other part of the brain, the symptoms due to involvement of that special portion, providing it was not a silent part of the brain, would be present, in addition to the symptoms referred to above.

The authors then reported in detail two cases of otitic brain abscess. The points of special intrest in the first case, from a neurological point of view, were that on account of the slight involvement of fibers coming down from the motor area, the subcortical location of the abscess was correctly surmised, while the rapid recovery from the speech defect and the disappearance of the motor paralytic symptoms in the extremities were astonishing. From a surgical standpoint, the case was of interest because it enabled one to open a discussion as to the best manner of approaching and draining temporo-sphenoidal abscesses and cerebral abscesses in general. The neurological interest of the second case was limited largely to the question of the localization of the abscess. In this case, the paretic symptoms of the right upper and lower extremity were distinct enough, but there was an entire absence of speech disturbance, although the original disease had involved the left ear. In view of this absence of speech disturbance it was natural to infer that the abscess was not in the temporo-sphenoidal lobe, where it had been looked for previously, but in the motor area, and the successful finding of the abscess at the time of the operation proved that this reasoning was altogether correct. In this second case, as in the first, recovery was prompt and complete.

When the surgeon was asked to deal with an abscess of the brain that was accurately localized, his concern was entirely with the technical parts of the operation. His work was to approach the abscess by the most direct route, evacuate the pus, and establish satisfactory drainage of the cavity. It was evident that in any case there were three main considerations: (1) A wide exposure of the area of the brain in which the abscess was supposed to lie. (2) The protection of the meninges from infection by the purulent contents of the abscess cavity. (3) Proper drainage of the abscess cavity. In those abscesses with soft walls that readily collapsed when the contained pus was evacuated, all that was required was the establishment of drainage by a thin slip of rubber tissue at the most dependent point of the cavity. This should be removed after 48 hours, and not re-inserted. In abscesses with rigid walls that showed no tendency to fall together, and that must be obliterated by the slow process of granulation, the drainage must be by a tube of some kind, whether rubber or decalcified bone or other material, depending upon the choice of the operator.

Dr. Gorham Bacon said he was fully in accord with the plan of treatment outlined by Dr. Whiting, and he had little to add to what had been said. He was in favor of gauze drainage, and was opposed to washing out these abscess cavities. The possibility of injuring adjacent brain tissue should never be lost sight of in these operations, and to help avoid such an accident the encephaloscope had proved of value. The speaker agreed with Dr. Wiener that abscess in the temporo-sphenoidal lobe was more frequent than in the cerebellum, and he recalled one instance which was on record where he had found an abscess in both locations in the same patient. In the case he had shown earlier in the evening, Dr. Bacon said he had taken the risk of introducing his finger into the abscess cavity, he had not washed it out nor drained it, and still the patient got well, while many other cases seen since that time and treated by what were now regarded as more ideal methods failed to recover. Perhaps the constitution of the patient had much to do with the final outcome of the case.

The diagnosis of temporo-sphenoidal abscess was at times extremely difficult. Pain was the most constant symptom, and usually we obtained a history of chronic purulent otitis media.

Dr. Gruening said the symptom of optic aphasia in these cases had been known to otologists for a long time. Dr. Wiener stated that most of these abscesses were located near the diseased bone, but that in a small percentage of cases they were located at some distance from the bone and apparently separated from it by normal brain tissue. Personally, he did not believe that this intervening brain tissue, through which the infection had been carried by the lymphatics and vessels, was entirely healthy.

Dr. Gruening said he had had perhaps ten unsuccessful cases of otitic brain abscess, and five successful ones and these were consecutive cases. He attributed his success to the avoidance of stiff drainage tubes, such as rubber. For drainage material he preferred gauze, and he was opposed to irrigation. He had never found it necessary to use the encephaloscope, and was afraid that it might be the means of producing a false passage.

Dr. James F. McKernon said there were simply one or two minor points to which he would limit his remarks. He had found the optic aphasia a prominent symptom in all of his left-sided cases of otitic brain abscess. In regard to irrigation of the abscess cavity, he had had four cases recover where he irrigated the cavity with normal salt solution. They were not acute cases, the suppuration having apparently been going on for a long time, and upon exposing the cavity its thickened contents would not flow out. In one instance where he used the encephaloscope, a false passage was produced, due probably to his lack of experience with the instrument at that time; since then he had used it with excellent results.

In dealing with a brain abscess with thickened walls and containing a large amount of detritus, he saw no objection to the employment of a gentle, warm irrigation. It was certainly less harmful than curetting. The speaker said that in addition to the four successful cases of the chronic type in which he had irrigated, he had also resorted to it in two cases of acute onset, one following the radical Stacke operation and the other after the opening of the mastoid and sinus. He had now given up irrigation in the acute cases, and simply mopped out the cavity with a bit of sterile gauze, but he would still continue to irrigate in chronic brain abscess with thickened membrane or limiting walls, which failed to collapse upon exposure, and where packing was necessary in order to produce healing. In two acute cases the speaker said he had employed rubber tissue drainage with good results. He used for that purpose rubber tissue about the size of a few strands of catgut, which were removed at the end of 72 or 100 hours and were then left out twisted together.

In discussing the value of blood examination in the diagnosis of brain abscess, Dr. McKernon said that in one case of suspected abscess of the chronic variety the differential blood count gave little or no information. Because there was but little absorption taking place, the leucocytosis was about 12,000, with a polymorphonuclear percentage of 45. Upon operation he found an abscess at the posterior tip of the temporo-sphenoidal lobe, and evacuated about two ounces of pus. In another case the polymorphonuclears were 94 per cent. and the leucocyte count 34,000, which confirmed the diagnosis. The blood count was a valuable measure in differentiating between the acute and chronic types of abscess. The speaker said that he had discarded the use of the rubber tube a number of years ago as a means of drainage, and now used either iodoform or plain gauze rolled up in the shape of a pencil.

Dr. E. B. Dench said he had operated on eighteen cases of otitic brain abscess, twelve of the temporo-sphenoidal type, and six of the cerebellar. Of the former, six had died, five had recovered and one was still under treatment. Of the cerebellar cases, five had died and one recovered. Among his acute cases, some had shown an increase in the polymorphonuclears to above 80 per cent., yet even in that type of cases that was not the invariable rule. In the chronic cases, the polymorphonuclear percentage was not usually very high.

Dr. Dench said he agreeed with what Dr. Gruening had said in regard to the encephaloscope. He could not appreciate how the educated finger could do as much harm as the uneducated encephaloscope. Ballance, in his operative work, used the finger regularly to gain access to the abscess cavity. Personally, Dr. Dench said, he employed two rather long retractors by which the brain substance was elevated, and this gave a very good view of the interior of the abscess cavity—better, he though, than the encephaloscope—and there was less danger of traumatism.

In dealing with chronic abscesses, he did not think it made much difference what method of drainage was employed. In some of his cases, both acute and chronic, he had found it necessary to employ different methods of drainage. In some cases, rubber tubes were employed, and in one case, in particular, where a gauze drain had been used, the case did badly until rubber tubes were substituted, when the patient made a perfect recovery. In most of the acute cases he preferred either the cigarette drain, composed of gauze surrounded with rubber tissue, or a simple drain of rubber tissue. The drain made of this last-named substance, was easily inserted, and was removed without difficulty. It had always seemed to the speaker that rubber tissue, on account of its easy removal, inflicted less traumatism upon the delicate granulation which was thrown out in the abscess cavity and along the fistulous tract leading to it, than did the sterile gauze. The speaker said he would not hesitate to irrigate a chronic brain abscess, with thickened walls, although this was not his invariable rule. At a meeting of the Otological Section of the American Medical Association, in Boston, Mr. Ballance had called the speaker's attention to the fact that cerebellar abscesses, of otitic origin, were twice as common as those occurring in the temporo-sphenoidal lobe. These statistics were derived from a large number of cases of brain abscess discovered at autopsy, and in looking over the various statistics of large hospitals, the speaker had found this to be an actual fact, namely, that cerebellar abscesses were about twice as frequent as abscesses of the temporo-sphenoidal lobe. Clinically, however, his own statistics showed that temporo-sphenoidal abscess was about twice as common as cerebellar. The speaker said that whenever the avenue of infection could be traced directly from the tympanic or mastoid cavity, the abscess should be opened along the avenue of infection. In this way, the subdural space would not be opened, for the membranes would be found to be thoroughly amalgamated as the result of the previous inflammatory process, and consequently, the danger of subsequent meningitis and hernia cerebri would be reduced to a minimum. In cases in which the path of infection could not be followed directly, and in which it was necessary to perform a purely exploratory operation, it would then be wise to enter the cranial cavity above the zygoma. In this way, the exploration of the brain would be carried on through a perfectly sterile field, and if no abscess were found, the danger of infection would be very slight. If, on the other hand, the exploration were carried on through the tegmen tympani and tegmen antri, the brain would be approached through an infected field, and death might occur as the direct result of the operation.

In these exploratory operations, the speaker was inclined to advocate the plan suggested to him by Mr. Ballance, viz., of doing the operation in two stages: The first stage would consist in exposing and incising the dura and packing off the subdural space with iodoform gauze, so as to cause the formation of adhesions and the obliteration of the subdural space.

Subsequently, the brain substance could be incised, and any purulent collection evacuated, without the danger of a subsequent meningitis. The speaker would therefore advocate doing a decompression operation above the zygoma in cases of temporo-sphenoidal abscess, or behind the lateral sinus in case of cerebellar abscess, incising the dura and packing off the subdural space with iodoform gauze for a period of from 12 to 24 hours. Subsequently, the cerebral or cerebellar substance could be explored for pus. In the meantime, the subdural space would be completely walled off by adhesions, and if an abscess were evacuated, the dangers of subsequent meningitis would be avoided.

Dr. W. Sohier Bryant said the spread of infection from the ear to the brain was accomplished in four ways: (*a*) Through the tegmen tympani into the middle fossæ. (*b*) Through the internal auditory meatus and aqueducts into the posterior fossæ. (*c*) Through the inner table covering the sigmoid groove covering the sinus into the posterior fossa. (*d*) The infection in one fossa may spread into the next. All varieties of brain abscesses were of infectious origin. They occurred in all gradations, from an encapsulated abscess with a distinct pyogenic membrane and a minute connection with the original source of infection, to the other extreme—a diffuse softening, a mere enlargement of the original infection.

After discussing in detail the diagnosis of otitic brain abscess, Dr. Bryant said the diagnosis was positive when focal brain symptoms occurred with a peripheral infection. A blood count was useful to determine the presence of active infection and the resistance offered to it by the patient, but it was of no value in locating the infection. Treatment was operative, and of two kinds: (1) Peripheral exploratory operations to confirm the diagnosis and to locate the abscess. (2) Central operation for evacuation and drainage after the abscess had been located. It was best to follow the path of infection in planning the location of drainage. An operation should be undertaken the moment the diagnosis was made. An exploratory operation for brain abscess should be done as soon as indications of mastoiditis, sinus thrombosis or meningitis were present. In reply to the question when should we operate for mastoiditis, the speaker said that this should be done at the earliest possible moment when the aural inflammation appeared to be beyond our control. The after-treatment of brain abscess should be directed to rigid asepsis to prevent reinfection or extension of infection, preservation of drainage and slow closure of the wound. The patient must be kept quiet for a long time after complete healing, and must be kept under observation for a year or more for fear of recurrence. Urotropin, in doses ranging up to 60 grains daily, by mouth, was an aid to intracranial antisepsis.

Dr. Bryant said that during the past two years he had had eight cases of brain abscess, three cerebral and five of the cerebral and cerebellar type combined, with 50 per cent. of recoveries after operation. All the cases which were fatal were treated under special disadvantages, either from complications, lack of opsonic resistance or delayed operation.

Dr. Joseph Fraenkel said that to the neurologist these cases of otitic brain abscess were comparatively rare. Personally, he had seen perhaps four or five, and he would limit himself to a discussion of the optic aphasia to which several of the speakers had referred. Marie had recently shaken our old-time conception of aphasia, and to-night, the speaker said, he had received another shock along that line. What the otologists had described as optic aphasia was better known to neurologists as anomia, which was the loss of power to give objects their correct names. This did not, in his opinion, constitute an optic aphasia. In a case of this kind that was under the observation of Dr. Charles L. Dana and himself, the autopsy showed a minute lesion in the temporo-sphenoidal lobe. A true optic aphasia would point to a lesion in the optic lobe or commissure.

In closing, Dr. Fraenkel emphasized the fact that the surgical finger could not be too highly educated in searching for a lesion in such a delicate structure as the brain.

Dr. J. Ramsay Hunt said the more he saw of otitic brain abscess, the more pessimistic he became regarding the difficulties that surrounded not only its diagnosis, but its treatment. During the past eight years he had seen fifteen cases; all of them were operated on and all of them died. The operations were done in various hospitals throughout the city, and these unfavorable statistics could not be laid at the door of any one surgeon or group of surgeons. All were cases of cerebral abscess and not extradural; of the latter, he had seen several get well.

As an instance of the diagnostic difficulties sometimes encountered, Dr. Hunt recorded a case of acute otitis media on the left side of three weeks duration in which there had been no focal symptoms of brain abscess and no general symptoms save unilateral headaches which accompany so frequently acute suppurative conditions of the ear.

A mastoid operation was immediately performed; a portion of the dura was found broken down and covered with granulations and this on exploration led into a large temporo-sphenoidal abscess, which had given rise to no speech or paralytic disturbances, and no optic neuritis. The patient was right handed.

Dr. Hunt also referred to a puzzling group of cases, with general symptoms of profound intoxication, including headaches, stupor, and delirium, in which focal symptoms are present suggesting a cerebellar localization; nystagmus, disturbances of gait and equilibrium, nausea and vomiting, even a low grade neuritis may be present. Cases of this group he had seen operated upon without demonstration of an abscess in the cerebellum, and he was inclined to regard the focal symptoms as of purely aural origin which with the profound general intoxication simulated closely cerebellar abscess. Optic neuritis may not be relied on absolutely as it may complicate acute otitis media.

Dr. Fisher said that in dealing with otitic brain abscess or even suspected abscess, he was in favor of an early exploratory operation, preferably by a surgeon specially qualified in that field.

Dr. William M. Leszynsky said that during ten years' experience as consulting neurologist to the Manhatten Eye and Ear Hospital he saw quite a number of these cases, which he though were less frequent now than formerly. He was inclined to believe that the otologist, as a rule, had a sort of euphonious disregard for the opinion of the neurologist in general, that he could get along without him in dealing with these cases, and that all that was necessary was an exploratory operation. The speaker said that the experienced neurologist could often be of much assistance to the otologist during the earlier stages of otitic brain abscess, before the symptoms had become so unmistakable that any tyro could make the diagnosis. He recalled one case, seen several times in consultation, in which the otologist could not be convinced that a cerebellar abscess was present until it was shown to him at the autopsy.

Dr. Leszynsky said that no mention had been made of one of the dangers attached to cerebellar abscess. Cases were on record when at the moment such an abscess was punctured, death occurred suddenly from respiratory paralysis. Such an instance had occurred under his observation. In view of that fact, it seemed logical to infer that in cases of brain abscess attended by sudden death from respiratory failure the lesion was located in the cerebellum rather than in the temporo-sphenoidal lobe.

In reply to Dr. Gruening, the speaker said that neurologists had long been familiar with this type of aphasia, which was of value in the recognition of otitic temporo-sphenoidal abscess when it was present. Most of the abscesses however did not occur on the left side, and it was invariably absent when the abscess occurred on the right side, unless the patient was left-handed.

Dr. Felix Cohn said that in obscure cases of otitic brain abscess, a blood count should never be neglected, as it might aid in differentiating the condition from various forms of meningitis. The speaker reported a case of cerebellar abscess in which the condition of the increased reflexes led to the correct diagnosis.

Dr. Whiting, in closing, speaking of the encephaloscope, said it was simply a question of using the instrument with which you were familiar. A workman must understand the use of the tools in his hands. Personally, he had had no difficulty in introducing it into the cavity of a brain abscess, and he knew of many others who were adept in its use. It was an instrument which with a very moderate amount of practice gave a remarkably clear view of the abscess cavity, and could be used with great precision.

Dr. Berg, in closing, said he was inclined to agree with those who preferred rubber tissue to gauze in the drainage of an acute brain abscess, but for drainage of a chronic thick-walled abscess, some form of tube drain must be used; for when gauze became saturated it no longer acted as a drain but as a tampon blocking up the pus in the cavity. In cases where drainage was really demanded, we could not rely on gauze; we had to resort to a tube of some material.

The President, Dr. Sachs, said that a common error made by surgeons and otologists was that they were inclined to attempt a brain operation through relatively small openings. If there was one factor that would lead to better results in brain surgery it was to do the operations through a large osteoplastic flap.

Dr. Sachs said the symptom of sensory aphasia had not been as carefully observed or reported as it deserved, and it was easily overlooked. The exact type of the sensory aphasia in these cases depended on the location of the abscess.